Republic of South Africa

EDICT OF GOVERNMENT

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SANS 10353 (2009) (English): Small arms shooting ranges

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SOUTH AFRICAN NATIONAL STANDARD

Small arms shooting ranges

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Table of changes

Change No.	Date	Scope
Amdt 1	2009	Amended to reduce the safety angle relative to the interception of any reasonable shot, to adjust figure 1, to provide detail for the required air changes and air velocities, and to correct table E.2.

Foreword

This South African standard was approved by National Committee SABS TC 1000, *Firearms, ammunition and ranges*, in accordance with procedures of the SABS Standards Division, in compliance with annex 3 of the WTO/TBT agreement.

This document was published in October 2009.

This document supersedes SANS 10353:2003 (edition 1).

Annexes A, B, C, D and F form an integral part of this document. Annexes E and G are for information only.

Contents

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Small arms shooting ranges

1 Scope

1.1 This standard covers general requirements for the planning, construction and operation of indoor and outdoor shooting ranges.

1.2 It does not apply to any area where it could otherwise be lawful to discharge a firearm.

2 Definitions

For the purposes of this standard, the following definitions apply:

2.1
backplate
steel plate that covers the area of the protected zone of an indoor range, behind and around the bullet trap, where bullet strikes are likely

NOTE The backplate has no direct equivalent on an outdoor range.

2.2
baffle
structure or device that is mounted with its face towards the firing point. It is intended to stop or redirect misdirected shots

2.3
bullet trap
bullet catcher
device or construction behind the targets intended to stop and trap shots that pass through or near the targets

2.4
danger area
fan shaped area of ground beyond the targets where those misdirected shots which do not impact on the stop butt, either in azimuth or elevation, will impact

NOTE 1 A danger area is not required if the stop butt is of sufficient size.

NOTE 2 Only outdoor ranges can have a danger area.

2.5
firing point
point, or points, from which shots may be fired on the range

2.6
protected zone
sidewalls, ceiling and the floor of an indoor range, behind and around the bullet trap and backplate, intended to stop all misdirected shots that can reasonably be expected to be fired

NOTE The protected zone is analogous to the stop butt on an outdoor range.

2.7
ricochet
bullet that continues to travel through the air after rebounding or skipping off some object or part of the range

2.8
safety angle
required minimum angle between the sighting line and an imaginary line drawn from the eye of the shooter to the top or side of the stop butt or protected zone

2.9
shotfall area
area where the shot fired from a shotgun falls

2.10
sighting line
imaginary line drawn from the eye of the shooter to the target

2.11
small arms
handguns, rifles and shotguns

2.12
stop butt
back stop
bank, wall or other device, behind and around the bullet trap, intended to stop all misdirected shots that can reasonably be expected to be fired

NOTE The stop butt applies only to outdoor ranges.

3 Categories of range

3.1 General

There are three basic categories of shooting range:

a) indoor ranges (see annex A);

b) outdoor no danger area ranges (see annex B); and

c) outdoor danger area ranges (see annexes C and D).

NOTE There is no essential difference between handgun and rifle ranges. However, the much higher velocities and muzzle energies of most rifle ammunition impose greater demands on the bullet trap, protected zone or stop butt, and danger area of the range. The use of a range for centre-fire rifles, in addition to handguns, will often be dependant on the economics of the necessary construction or the danger area available.

3.2 Indoor ranges

An indoor range is a range that is constructed inside a building.

3.3 Outdoor no danger area ranges

A no danger area outdoor range is constructed or designed in such a way that no misdirected shot, which can reasonably be expected to have been fired towards the targets, will leave the range.

3.4 Outdoor danger area ranges

3.4.1 Outdoor danger area (see 2.4) ranges are ranges where the stop butt is not sufficiently high or wide enough to comply with the requirement to contain all reasonably expected misdirected shots.

3.4.2 Outdoor danger area ranges therefore have a danger area that extends beyond the stop butt. In the case of shotgun ranges, there is no stop butt, and the danger area becomes the shotfall area.

4 Potential hazards associated with shooting ranges

4.1 Indoor range potential hazards

The following potential hazards should be taken into consideration when an indoor shooting range is being designed and constructed:

a) bullets that strike some part of the range other than the bullet trap and ricochet so as to pose a hazard to shooters or to a third party;

b) splashback of particles from target frames, from the bullet trap or from any other item within the protected zone;

c) noise from the discharge of firearms that damage the hearing of the shooters;

d) noxious fumes from propellant gases;

e) lead dust and particles from unjacketed bullets;

f) risk of fire from dust build-up and from tracer ammunition;

g) ejected cartridge cases or gas and propellant particles that can strike an adjacent shooter;

h) inadequate lighting that affects the shooter's ability to clearly see the sights and targets; and

i) incorrect usage of the range.

4.2 Outdoor range potential hazards

The following potential hazards should be taken into consideration when an outdoor shooting range is being designed and constructed:

a) bullets that miss the stop butt and leave the range;

b) bullets that strike some part of the range other than the stop butt, ricochet, miss the stop butt, and thus leave the range;

c) splashback of particles from target frames, from the bullet trap or from the stop butt;

d) noise from the discharge of firearms that damage the hearing of the shooters;

e) ejected cartridge cases or gas and propellant particles that can strike an adjacent shooter;

f) glare from the sun that affects the shooter's ability to clearly see the sights and targets;

g) people who enter the danger area or the range itself;

h) incorrect usage of the range; and

i) any extraordinary hazards, for example low-flying aircraft from a nearby airfield.

5 Distances over which ammunition is dangerous

The danger area dimensions mentioned in annexes C and D take into consideration the distances over which ammunition is dangerous.

NOTE Small arms projectiles will travel a considerable distance (see annex E) when fired at a slight elevation angle.

6 Construction of a range

6.1 Stop butt or protected zone

6.1.1 The range shall have a stop butt in the case of an outdoor range, or a protected zone in the case of an indoor range. The stop butt and the protected zone shall be of such height and width that they will intercept any shot that can reasonably be expected to have been fired in the general direction of the targets. For this purpose the ends and top of the stop butt and the protected zone shall subtend a safety angle of 8° (see figure 1) from the sighting line, as seen from the firing points. The safety angle of 8° equates to a height of 143 mm for every metre between the firing point and the stop butt. The height of the sighting line above the ground shall be added to the height of the calculated safety angle to determine the required height of the stop butt. The stop butt and the protected zone shall, in addition, be of such thickness and material that bullets will not penetrate or cause ricochet or splashback of bullets or pieces of bullet. **Amdt 1**

6.1.2 The size of the stop butt and of the protected zone will depend on the length of the range from the rearmost firing point to the targets, the distance between the targets and the stop butt or the protected zone, the width of the firing point (points) and the height (or heights) above the ground (or range floor) from where shooting takes place (prone or standing shooting, etc.).

6.1.3 Specific requirements for different types of range are given in annexes A, B, C and D.

6.2 Danger area

6.2.1 The construction of a stop butt becomes impracticable or uneconomic on ranges exceeding 50 m to 100 m, unless a high hill is available. In such cases it is necessary to have a fenced-off danger area beyond the stop butt. Such danger area shall not be entered by people or animals whilst the range is in use.

6.2.2 It is not uncommon to use such a danger area for farming. However, measures shall be taken to clear the area before the range is used, and warning notices and flags to this purpose shall be employed.

6.2.3 The extent of the danger area (see figure 2) will depend on the types of firearm used on the range (handgun, shotgun or rifle, or some combination), the length of the range and the width of the firing point or points.

6.3 Bullet trap

6.3.1 The bullet trap shall not only stop or trap bullets without splashback or ricochet, but it shall continue to do so in the face of repeated impacts over a concentrated area. The most commonly used basic forms of bullet trap are:

a) a sand or earth bank that is usually employed on outdoor ranges, and

b) steel sheets that either deflect the bullets down into sand or into a water-filled tray, or that redirect the bullets into a swirl chamber where repeated impacts remove the bullets' energy.

6.3.2 The earth bank type of bullet trap shall be regularly dug out and the soil sieved ("de-leaded") to remove spent bullets and stones that could cause ricochets, and the slope of the bank restored.

6.3.3 The steel sheet type of bullet trap shall have any damage repaired by welding and smooth grinding. Thick plate, preferably armoured steel, should be used as a bullet trap.

6.4 Ricochet prevention

Ricochet can occur when a bullet strikes a hard surface at an oblique angle. A ricocheting bullet will not leave the surface at the same angle at which it impacts and if the floor and walls of an indoor range are hard and smooth, a bullet that strikes the floor or wall will ricochet and will continue to do so down the range and can strike in the protected zone and on ricochet-preventing baffles. Similar conditions apply to outdoor ranges, with the added danger that a ricocheting bullet could miss the stop butt and leave the range.

For this reason targets shall not be placed on the floor of the range, but shall rather be so elevated above the ground that the bullets will impact on the bullet trap.

Where obstructions cannot be removed, baffles shall be used to trap or deflect potential ricochets.

RECOMMENDATION: Eye protection should be worn during shooting.

6.5 Baffles

6.5.1 Baffles are installed for one of the following two purposes:

a) The main purpose is to control ricochets, preventing light fittings, wall pillars and other obstruction from being hit and causing uncontrolled ricochets, and also protecting the fittings against damage;

b) To stop misdirected shots which could be expected to leave the range since the protected zone (indoor ranges) and the stop butt (outdoor ranges) are not as high or as wide as they should be.

6.5.2 The baffles shall be so positioned that they intercept the sighting line, and hence the line of fire, of shots that are fired too high or too wide to impact on the protected zone or on the stop butt. They can be used in the case of a stop butt of insufficient height on an outdoor range, or instead of a bulletproof ceiling (in the protected zone area) in an indoor range. However, the disadvantage is that they severely limit the positions in the range where firing points may be situated.

6.5.3 All baffles should be faced with a material that prevents the splashback of bullets, for example 50 mm thick softwood (on the face of the baffle facing the firing point) spaced from the steel on 50 mm battens. The wood facing stops splashback, and the space between the steel and the wood prevents damage to the wood from ricochets across the face of the baffle. The battens should be mounted vertically to permit bullets and particles to fall out.

6.5.4 Consideration should be given to secondary projectiles when baffles are within 10 m of any firing point.

6.6 Firing point

6.6.1 For safety reasons, shooters shall be a minimum of 1,8 m apart. This will dictate the number of shooters who may shoot at the same time, or conversely dictate the width of a firing point required on a new range. Screens are sometimes used between firing points on a range where firing always takes place at one fixed distance. In these circumstances the distance between shooters can be reduced to 1 m. However, screens cause ejected cartridge cases ("brass") from self-loading pistols to bounce around and sometimes strike the shooter.

6.6.2 For standing shooting the firing point should be a flat hard surface. However, for prone shooting a surface that slopes slightly upwards towards the targets is preferred. For outdoor ranges the firing point surface should also be of a nature that drains well and will not become a mud bath in wet weather or a dust bowl in dry weather.

6.6.3 If tables or benches are used in front of the shooters at the firing point, they should be made of wood to prevent ricochets or splashback if accidentally hit by a shot.

6.7 Ventilation and dust control

6.7.1 Indoor ranges shall have extractor fans installed. Such fans should be installed at the target end of the range so that fumes are drawn away from the shooters and any range staff or spectators. Filters on the outlets of the ventilation ducting will reduce the discharge of lead dust into the atmosphere. Inlet ventilators shall be installed behind the shooters.

6.7.2 All harmful smoke and airborne particles shall be extracted and shooters shall be supplied with clean air. Air supply and ventilation within an indoor range shall be such that the air speed measured at a level of 1,5 m above floor height shall not be less than 0,3 m/s over the cross-sectional area of the range. A minimum of 15 air changes per hour shall be circulated. Where air is re-circulated, such air shall be filtered at a rate of not less than 99,9 % efficiency. Care shall be taken to minimize lead vapour. **Amdt 1**

6.7.3 It is recommended that a build-up of dust in an indoor range should be avoided by regular weekly cleaning. Dry dusting should be avoided to prevent the dust from becoming airborne.

NOTE Although modern propellants are "smokeless" they nevertheless liberate large quantities of gas and particles, which are neither pleasant nor healthy when inhaled. In addition, unjacketed lead bullets can release particles of lead into the air when they break up on impact. Excessive exposure to lead particles and fumes can be dangerous; hence the need for ventilation.

6.8 Noise reduction in indoor ranges

6.8.1 Hearing protection shall always be worn on both indoor and outdoor ranges.

6.8.2 It is recommended that noise absorption materials be installed on the walls and possibly also in the ceiling. The advice of an acoustics expert should be considered.

6.8.3 The materials used should be non-flammable.

6.9 Location of a range

It is recommended that an environmental impact study be carried out to evaluate the ecological impact of the range on the surrounding environment.

6.10 Noise abatement

Indoor and outdoor ranges can largely be treated together when noise abatement is being considered.

When a range is planned and the positioning of a range is being decided on, the surroundings of the range should be taken into consideration. An industrial or business area is preferable to a residential area. In the case of an indoor range, a stand-alone building will avoid the transfer of noise to adjacent properties through the structure of the building. Danger area ranges shall be situated in sparsely populated locations. Even so the positioning of the range should take adjacent dwellings into consideration.

In the case of an outdoor range (with or without a danger area) screening of the firing points by means of earth banks, rows of shrubs or trees, etc., can make a considerable difference to the propagation of noise away from the range.

6.11 Range orientation and lighting

6.11.1 It is recommended that outdoor ranges in the southern hemisphere should be orientated facing south to keep the sun out of the shooters' eyes.

6.11.2 Indoor ranges should be lit throughout their length. If required, dimmers can be used to enable low light shooting practice.

7 Range (shooting) safety

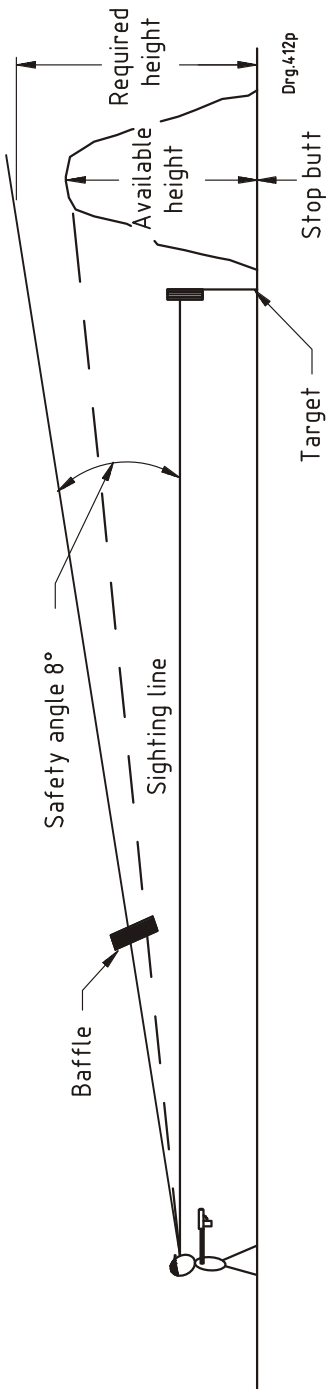
7.1 Irresponsible conduct of shooters can negate the safety measures built into the range design.

7.2 Shooters shall obey the range (shooting) safety rules at all times.

7.3 The shooting needs to be supervised by a person competent to do so and who is able to give his or her full attention to the safety aspects without the distraction of trying to shoot at the same time. Such a supervisor is known as the “range officer”.

7.4 The duties of a range officer are given in annex F and recommended range safety rules are given in annex G.

7.5 The range should have first aid resources.



Amdt 1

Figure 1 — Application of the safety angle (showing the use of a baffle)

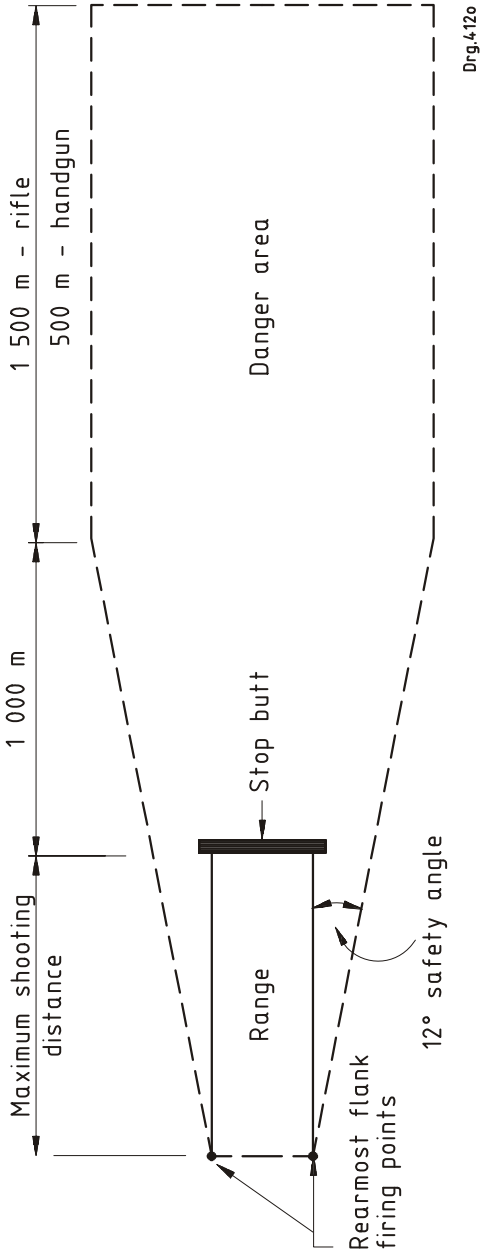


Figure 2 — Outdoor danger area range (danger area template)

Annex A
(normative)

Indoor ranges

A.1 Bullet trap

The bullet trap can take one of several forms of angled (45°) steel plate or plates that direct the spent bullets down into a sand or a water pit. Alternatively, an escalator type of steel plate trap can be used which, while more complex to construct, will require less maintenance. A sand bank, as used on outdoor ranges can also be used, but this will take up considerable space and can lead to a dust and dirt problem. Heavy plastic sheeting can be hung in front of the bullet trap to stop small particles of splashback and dust from returning up range.

Old car or truck tyres should not be used as a bullet trap. Many tyres contain metal bands that can cause ricochets. Spent bullets can lodge in the tyres and also cause ricochets. There is also a distinct risk of fire from the particles of rubber broken out by the impact of the bullets.

A.2 Backplate

The backplate should cover the rear wall behind the bullet trap, and should extend outwards to cover the entire part of the rear wall that falls within the protected zone (see A.3). The area of the backplate that is visible from the firing point(s) shall be faced in the same way as baffles (see 6.5.3).

A.3 Protected zone

This is the part of the range that is enclosed by the safety angle of 8° to the sighting line in the vertical plane and 12° to the sighting line in the horizontal plane. All parts of the range that fall within this zone shall be bulletproof and proof against ricochets and splashback. Smooth-faced flush-jointed double brick or 250 mm dense concrete or similar can be considered suitable. Where parts of the structure within the protected zone are not considered bulletproof, they shall be overplated with steel plate. **Amdt 1**

Where the rear wall of the range does not contain the safety angles, those parts of the sidewalls or ceiling (or both) that come within the safety angles shall also be bulletproof, and proofed against ricochets and splashback. Suitably designed and situated baffles may be erected instead of the bulletproofing of sidewalls or ceilings where this is more practicable or economic.

The floor of the range should be hard (e.g. concrete) and smooth, and should be kept clear of any object that could cause ricochet(s) if struck by a bullet.

Facing (as for baffles) should be used when the protected zone surfaces are not proofed against ricochet and splashback.

NOTE 1 The required size of the protected zone can be calculated by taking the safety angle of 8° as equating to 143 mm for every metre of distance between the firing point and the backplate and 12° as equating to 214 mm for every metre of distance between the firing point and the backplate. **Amdt 1**

NOTE 2 Centre-fire rifle ammuntion can inflict major damage to steel plates and great care is needed in selecting suitable plate material and thickness. Armoured steel is highly preferable.

NOTE 3 Steel overplating of the protected zone is only required when the structure is not bulletproof. However, in the long run overplating might prove more economic.

A.4 Range entrances

No door or entrance should exist forward of the rearmost firing point, unless secured from the inside. A red light should be fitted above all doors that give direct access to the range itself (not the building). Such lights should be switched on whenever the range is in use.

A.5 Fire

Cognizance should be taken of local bylaws, and a fire extinguisher should be available on the premises.

Annex B
(normative)

Outdoor no danger area ranges

B.1 Stop butt (back stop)

The stop butt (back stop) shall be enclosed by the safety angle of 8° to the sighting line in the vertical plane and 12° to the sighting line in the horizontal plane. The stop butt should be the steep side of a hill, the wall of an abandoned or disused quarry, sandpit, etc., a purpose-erected bulletproof brick or concrete wall, or a bank of hard earth. In the latter case the core of the bank can be made of hard fill such as rock, building rubble, etc. The minimum slope of the face of the stop butt is 56° from the horizontal, and the face will have to be of hard material to retain such a slope over time. It will thus be unsuitable to also act as a bullet trap. The stop butt should be of height not less than 5 m for all shooting over distances of 15 m or less. **Amdt 1**

A thick covering of light earth or sand would make a suitable bullet catcher, but this would collapse to a natural angle of repose of 30° to 35° as a result of weathering, de-leading and constant bullet impacts. It is therefore normally more practicable and economic to provide a bullet trap as a separate entity.

B.2 Bullet trap

The bullet trap can be made of steel plate in the same way as for indoor ranges, but a thick bank of earth or sand is normally more practicable. Care shall be taken to ensure that all rocks and stones are removed from the material used, and that the top part of the bank is deep enough from front to back. It should be remembered that bullet strikes occur at target level, not ground level. The bottom front of the bank can be made of a sand bag wall to avoid what would otherwise be a sloping bottom taking up considerable space. A top-covering layer of mixed sand and sawdust will provide a light non-caking surface that can easily be de-leaded when required.

B.3 Baffles

Where the stop butt is not, or cannot economically be made wide enough or high enough, baffles should be used to block the sighting line beyond the stop butt sides or top (or both). Regardless of the use of baffles the stop butt shall be of height not less than 5 m.

B.4 Range floor (ground)

The range floor shall be free from hard surfaces, rocks or other ricochet-inducing surfaces. A sand or grassed surface is preferable, and drainage should be taken into consideration when the range is being constructed.

B.5 Range boundary

The periphery of the range should be fenced and warning notices permanently displayed. The fence should pass some 5 m behind the stop butt.

Annex C
(normative)

Outdoor danger area ranges with stop butt

C.1 Introduction

The most common application of such ranges is for rifle shooting up to a distance of 600 m, and sometimes further. However, similar design considerations apply to any outdoor range where the stop butt is not, or cannot be made, big enough.

C.2 Danger area

Shooting ranges shall be so constructed that the full danger area is on ground not frequently used by the public. No occupied buildings, public roads, power lines or telephone lines should lie in the danger area. Private roads and footpaths are permissible provided that they are closed when firing is in progress.

The length of the standard danger area beyond the stop butt is 1 500 m for handguns and 2 500 m for centre-fire rifles. The width will vary according to the width of the firing point, which in turn will dictate the number of shooters who can be accommodated (see 6.6.1).

The above are minimum distances, and all new ranges should be constructed to comply with these limits. The danger areas of certain old established ranges might not conform to the distances given. However, these ranges may well be acceptable, subject to the following conditions:

a) that it is impractical or impossible to extend the danger area to the prescribed dimensions; and

b) that the past history and accident record of the range indicates that it is safe to use.

Warning notices and flags shall be employed around the periphery of the range and its danger area, and both of these shall be fenced in with at least the equivalent of a five-strand farm fence. Warning notices and flags shall be placed in such a way that they are visible to a person approaching the range from any direction.

C.3 Determination of the required danger area

This is done by applying the safety angle of 12° from the rearmost flank firing point(s) to a line 1 000 m beyond the stop butt, and then continuing parallel to the line of fire for a further 500 m or 1 500 m as appropriate (see figure 2).

All the corners of the shooting range's danger area shall be marked permanently. If, for practical reasons, this is not possible, for example the safety area falls within the fields of a farm where the day-to-day actions of the owner will be impaired, other points on the side directly opposite to the corners shall be marked so that during inspections, the corners can easily be plotted.

C.4 Reduction of the danger area under certain circumstances

If a sufficiently high hill exists within the standard danger area, it may be possible to reduce the size of the danger area. The height of the hill shall be taken in relation to the extension of the sighting line to a position perpendicular from the hill top, and not from the height of the targets.

C.5 Location of the range

The ground should be level and the sub-soil firm. An uphill site should be avoided as the chances of ricochets are greatly increased. A hollow site is also unsuitable because, unless the hollow is shallow (in which case the firing points can be built up to give a level line of sight), the sighting line on the shorter ranges would invariably be uphill. This increases the chances of ricochets. Also a target frame suitably positioned for firing from the shorter distances is liable to be struck by shots from the more distant firing positions.

C.6 Stop butt (back stop)

All rifle, shotgun slug and handgun ranges require a stop butt. A stop butt can be either natural or artificial. When viewed from each firing point, the top of the stop butt shall protrude at least 1,8 m above the sighting line and 1,2 m above the top of the target.

On certain sites, a hillside may enable the dispensation of an artificial stop butt. In such cases the ground at the rear of the targets shall rise at an angle of not less than 30° to the general level of the firing points. If the angle is less than 30°, the hillside should be scarped from a height of 1 m above the targets to 0,3 m below the lowest possible line of fire from the most distant firing point. If an ample danger area is provided, the scarping is not essential and some form of bullet trap on the face of the hillside may be substituted, if more economical.

The stop butt shall be of such length as to project at least 3 m beyond the outside edges of the outermost targets. Allowance should be made during construction for wear and tear due to the weather and the strike of bullets. The face of the stop butt need not be steeper than the natural slope of the material from which it is made, a slope of 1 in 3 is usually suitable. The material of the stop butt is a matter for local consideration, but an area behind each target should be faced with earth or sand to show the strikes of the bullets.

The distance of the stop butt from the targets depends on the material used to construct the butt. When sand or soft earth free from stones, etc., is used, the butt may be placed within 5 m of the targets. The presence of stones, etc., is a common cause of splashback and when stones are present, the distance shall be not less than 30 m. When possible, the butt should be 30 m from the targets, the intervening space can then be adapted for use as a 25 m range.

C.7 Markers' gallery (if required)

In the case of penetrable targets, the requirements for the gallery (markers' shelter) are practically the same, whatever apparatus or pattern of frame for holding the targets is used. The main conditions to be fulfilled are the following:

a) the gallery shall be exactly at right angles to the axis of the range and parallel to the stop butt;

b) the height of the gallery shall be not less than 2 m;

c) ample protection shall be provided to ensure the safety of the markers;

d) to facilitate marking, the markers should be able to see the strikes of bullets on the stop butt;

e) the roof of the gallery shall slope slightly downwards towards the targets to avoid ricochets from the roof on to the targets. A layer of sand or earth should be used to reduce the chances of these ricochets;

f) the crest of the gallery should be defined with a plank on the edge. Care should be taken to keep the gallery crest up to the limit to avoid the formation of scoops in front of the targets, which can cause widely divergent ricochets by shots that strike the sides of the scoops;

g) the bottom of the target shall be raised so that it can be seen clearly from all firing points;

h) the choice of concrete or brick for construction will depend on the supply of these materials and the situation of the range;

i) the actual level of the floor of the gallery in relation to the ground level is a matter for local consideration. It might be necessary to keep the gallery as low as possible in order to reduce the height of the stop butt or to raise the floor level to provide for efficient drainage of both the gallery and the target trench;

j) it should be remembered that ricochets that occur from a range on which the targets are some distance above the ground level are likely to be fewer than when the targets are positioned at lower levels;

k) the retaining wall and the gallery shall be bulletproof. The material from which they are constructed depends on the permanency of the range. It is recommended that the whole construction be of brick or concrete; and

l) the entrance to the sunken gallery should be by a ramp, as steps increase the difficulty of transporting targets and other stores. It is essential that if steps are provided they be made as wide as possible.

C.8 Firing points

The firing points are normally at ground level. Raised platforms might, however, be needed when the site is hollow or swampy, or when the targets are not visible without them. Where raised platforms are required, the width at the top should be not less than 3 m.

Where a stop butt has to be constructed, building up the firing point can permit the stop butt to be lower than would otherwise be the case.

C.9 Other construction considerations

C.9.1 Target numbers

If required, all targets can be numbered from the left, looking from the firing point. Numbers should be placed on the crest of the stop butt in such a position that, looking from the firing points, each number appears directly above the target.

C.9.2 Flagpoles and flags

C.9.2.1 General

Flagpoles and red danger flags shall be provided as indicated in C.9.2.2 to C.9.2.4.

C.9.2.2 Stop butts

A tall flagpole shall be erected at one end of the stop butt. The flagpole to be fitted shall allow for the hoisting of a 1 m^2 red danger flag.

C.9.2.3 Markers' shelter

A flagpole shall be erected at one end of the markers' shelter and show at least 2 m clear of the shelter roof. It shall be possible to hoist a 1 m^2 red danger flag from under cover of this shelter.

C.9.2.4 Firing points

A portable flagpole, to which a 1 m^2 red danger flag has been attached, shall be available for use on the firing points.

C.9.3 Target store

A target store is normally required on ranges. It is best to construct it as a continuation of the markers' shelter when it can be a lean-to shed with back and end walls of brick or concrete and with a corrugated iron roof. The size will depend on the number of targets to be stored.

C.9.4 Communications

Telephone or radio communication between the markers' shelter (where there is one) and the firing points is recommended.

Annex D
(normative)

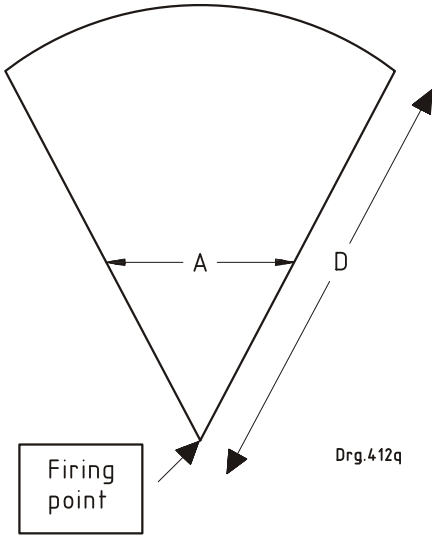
Outdoor shotgun ranges (no stop butt) for shot cartridges only

D.1 General

Although the muzzle energy of most shot cartridges is high, this energy is shared between the total quantity of shot, and the energy of each individual shot is low. Furthermore, round shot has a ballistically inefficient shape; as a result the velocity and energy rapidly fall and the maximum range is very limited in comparison with that of a normal bullet. However, even falling spent shot can cause injury, particularly to unprotected eyes, and a danger area is required.

Shotguns are usually fired at moving targets and so the precise direction of fire can vary over a wide arc. The spent shot can also be carried by the wind. The shotfall area shall take both these factors into account in addition to the theoretical maximum range.

A stop butt is not required for outdoor shotgun shooting with shot cartridges. Instead a shotfall area that conforms to figure D.1 and the dimensions given in D.2 shall be applied.



Key

A angle
D distance

Figure D.1 — Shotfall area

D.2 Distance D

Table D.1 — Length of shotfall area

1	2
Shot size, diameter	**Distance D** m
7 to 9 / 2 mm to 2,5 mm	300
AAA to BB / 4 mm to 5 mm	550
LG to SSG / exceeding 5 mm	1 000[a]
[a] If used for aerial targets. For ground targets, a stop butt range would be a better choice.	

D.3 Angle A

The required distance D applies to at least the entire arc over which shots may be fired. For aerial targets thrown across the front of the shooter, this will normally mean an angle of 180°. For targets thrown away from the shooter, a narrower angle will be appropriate.

Where a clear shotfall area can only be obtained over a limited angle, barriers or a shooting cage are recommended to prevent the shooter from swinging the shotgun beyond the limits of the area.

D.4 Trap protection

Many forms of clay target shooting require that the target traps be positioned forward of the shooter. In such cases protection shall be installed to entirely shield the trap and operator from any shot fired towards them from the firing point. Such shields shall be shot proof, and can be either permanent (brick, concrete, etc.) or temporary (multiple straw bales and zinc sheeting, etc.).

Annex E
(informative)

Examples of maximum ranges

Table E.1 — Shot cartridges

1	2
Shot size, diameter	**Maximum range** m
7 / 2,5 mm	200
BB / 4 mm	350
LG to SSG / exceeding 5 mm	800

Table E.2 — Ammunition of muzzle velocity less than 330 m/s (1 000 ft/s)

1	2	3
Ammunition/firearm	**Calibre examples**	**Maximum range** m
Rim-fire cartridges	22 shot 22 long rifle	1 000 1 500
Centre-fire handgun cartridges	9 mm short, 38 Special, 45 Automatic Colt Pistol (ACP)	1 500

Amdt 1

Table E.3 — Ammunition of muzzle velocity exceeding 330 m/s (1 000 ft/s)

1	2	3
Ammunition/firearm	**Calibre examples**	**Maximum range** m
Shotgun slugs	12 bore	1 400
Rim-fire cartridges	22 long rifle	1 500
Centre-fire handgun cartridges	9 mm Parabellum, 357 Magnum	2 500
Centre-fire rifle cartridges	223 Remington, 308 Winchester, 30-06	2 500 to 4 000

Annex F
(normative)

Duties of the range officer

F.1 One or more range officers shall be responsible for supervising the conduct of most of the shooting at ranges. Only shooting by experienced shooters is excluded. In such instances the shooters should appoint one of their shooters to undertake the duties of the range officer.

NOTE The range officer's responsibility is safety, not whether shooting is carried out in accordance with the rules of a particular shooting discipline or competition.

F.2 The range officer shall be a responsible for the following:

a) to ensure that all the shooters are acquainted with the provisions of the range rules;

b) to ensure that the range safety rules are observed at all times;

c) constantly supervising the shooters whilst they are at the firing points;

d) for controlling or operating any barrier, warning or signalling systems at the commencement of, during, and at the conclusion of shooting activities;

e) for managing and supervising ancillary staff such as target operators, etc.;

f) for deciding when shooting is to commence, interrupted and ceased;

g) to ensure that all firearms in use on the range are holstered or put down unloaded before anyone is allowed to proceed in front of the firing point, for example to change targets;

h) be empowered to exclude from the shooting range persons who disrupt operations or pose a threat to safety, and also persons perceptibly under the influence of alcohol or drugs;

i) to ensure that all spent cartridge cases and litter are removed from the range; and

j) to ensure that all shooting exercises are carried out in accordance with the shooting instructions for that particular range.

Annex G
(informative)

Recommended range safety rules

G.1 General

General as well as specific safety requirements for a shooting range should be laid down in a set of range safety rules. These rules should be displayed at the firing point(s) and also at the entrance to the range. Taking into account local conditions and the type(s) of shooting practised, the rules should contain the following stipulations:

a) the types of firearm, ammunition and bullet that are permitted or not permitted on the shooting range and any specific types of firearm, ammunition and bullet not to be used;

b) commands and signals to be used, such as "Fire", "Cease fire", and the like, should be explained; and

c) the safety measures (closing of barriers, hoisting of warning flags, switching on of warning lights, ventilation, emergency lighting, etc.) to be taken before any shooting event, and also the opposite measures to be taken after such event (opening of barriers, etc.) should be stated.

G.2 Rules of conduct for shooters

The following rules should be observed:

a) the firing point shall not be left with a loaded firearm (not applicable in the case of a firearm carried for self-protection);

b) firearms shall only be loaded at the firing point on instruction from the range officer, and with the barrel pointing at the bullet trap;

c) under no circumstances shall glass bottles, etc. be used as targets;

d) no shooting shall be done at targets, tin cans, or any other item placed on the floor of the range, since this poses a ricochet hazard;

e) turning around with a loaded firearm is forbidden;

f) firearms shall be holstered or put down unloaded, whenever shooting is interrupted for target changing, etc. Under no circumstances may firearms be handled whenever anyone is in front of the firing point(s) in use at the time;

g) other people's firearms shall not be touched without the express permission of the owner;

h) hearing and eye protection should be worn during shooting;

i) smoking and handling of naked lights on indoor shooting ranges is prohibited;

j) instructions given by the range officer shall be complied with unconditionally; and

k) persons engaged in shooting (shooters, target changers, ancillaries, etc.) shall not be under the influence of alcohol or drugs.

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